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JEFFREY I. KAPLAN  
OF COUNSEL  
FRANCINE MEYER  
EZRA SUTTON  
JOHN G. DE LA ROSA

LAW OFFICES OF  
JEFFREY I. KAPLAN  
900 ROUTE 9 NORTH  
WOODBIDGE, NEW JERSEY 07095  
(908) 634-7634  
TELECOPIER (908) 634-6887

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68895 U.S. PTO  
08/889975  
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Date: July 9, 1997

Re: Inventor(s): Gad Janay and Todd Yampel  
Title: CONFIGURABLE TERMINAL CAPABLE OF  
COMMUNICATING WITH VARIOUS  
REMOTE COMPUTERS

Attorney Docket No.: 30/01

Honorable Commissioner of  
Patents and Trademarks  
Washington, D.C. 20231

Dear Sir:

Submitted herewith is the above-identified patent application. Also enclosed are:

- 1) 2 sheets of informal drawings;
- 2) A check for the amount indicated below;

**Fee Computation: Small Entity**

Basic Fee:	\$ 385.00
Total claims:    -   = <u>  X  </u> = <u>      </u>	
Independent claims:    -   = <u>  X  </u> = <u>      </u>	
Multiple dependent claim(s)(\$115)	<u>  0  </u>
Assignment recordal (\$40)	+ <u>  0  </u>
<b>TOTAL</b>	<b><u>\$ 385.00</u></b>

The Commissioner is authorized to deduct any additional fees due from our deposit account No. 11-0223.

**CERTIFICATE OF MAILING**

Express Mail mailing label number: TB611348815  
Date of Deposit July 9, 1997

I hereby certify that this paper or fee is being deposited with the United States Postal Service *Express Mail Post Office to Addressee* service under 37 C.F.R. §1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Jeffrey I. Kaplan  
(Typed or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

JIK:mc

Respectfully Submitted,

LAW OFFICES OF JEFFREY I. KAPLAN

JEFFREY I. KAPLAN  
Reg. No. 34,356

**CONFIGURABLE TERMINAL CAPABLE OF  
COMMUNICATING WITH VARIOUS REMOTE COMPUTERS**

**TECHNICAL FIELD**

5           This invention relates to computer terminals, and more specifically, to an improved configurable computer terminal which can emulate a variety of different terminals and implement a variety of different communications protocols, depending upon which of a plurality of remote computers with which it is communicating.

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**BACKGROUND OF THE INVENTION**

15           Large main frame computers have been in use for many years. With the onset of personal computers however, many applications have moved towards being implemented as distributed systems. Specifically, many applications are now implemented by employing a plurality of personal computers on a network, each of which implements one or more functions required to implement an entire application or system.

20           Notwithstanding the widespread use of personal computers, the applications operating on large mainframe computers continue to be used. Moreover, given the large transaction cost to convert systems running on large mainframes to PC based systems, it is unlikely that the large mainframe systems will be obsolete any time soon. Additionally, there are certain applications which may be implemented better on a large mainframe computer, such as an IBM S/390 or AS400. Accordingly, many systems remain in use which utilize these large mainframes.

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The large mainframes were initially designed to communicate with "dumb" terminals. However, recently it has become popular to utilize a personal computer instead of a dumb terminal, and to have the personal computer emulate the dumb terminal. Thus, the remote host believes it is communicating with a dumb terminal but it is actually communicating with a personal computer which presents the communications interface of a dumb terminal. Such a system allows the personal computer to interpret and reformat some of the information being transferred between the host computer and the terminal emulator so that a more user friendly interface is presented by the terminal emulator.

Most applications running on the host download to the terminal emulator a "green screen", a textual screen which is known to those in the computer industry and which is usually very user unfriendly. U.S. Patent No. 5,530,961 ("the '961 patent"), assigned to the same assignee as the present invention, describes a technique for identifying these green screens and presenting them in a graphical user interface (GUI) format. As taught by the '961 patent, the green screens are identified using one of a plurality of specific algorithms, and then the presentation of that screen is determined by a table look up.

U.S. patent application serial No. 08/722,583 ("the '583 application") also describes a plurality of screen recognition algorithms. Any of the algorithms and techniques set forth in the



applications.

When the thin client desires to emulate the terminal and connect to a particular host, communications over a network are first established with a remote server, which downloads to the NC the appropriate communications software for communicating with a particular host. The communications software is then used to establish communications between the NC and the selected host.

Thereafter, as host screens are downloaded to the terminal emulator, the terminal emulator performs the screen recognition algorithm, and sends the results to the server. The server then returns to the terminal emulator the appropriate parameters for displaying the screen in GUI format.

In accordance with the foregoing, the terminal emulators may all be NC terminals since all of the tables and communications software are stored at a specified one or more servers. Moreover, it is not necessary to store all of the information required for the GUI screens at all of the terminals, as each can contact the server via, for example, the Internet.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a conceptual block diagram of a terminal emulator connected to a host computer over a network for purposes of implementing the techniques of the present invention: and

Figure 2 shows a flow chart of exemplary software resident on a terminal emulator which can be used to implement the techniques of the present invention.

5     DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

10     Figure 1 shows a conceptual diagram of a network 101 and several computers and servers connected thereto. The network 101 is preferably the Internet, but may be any local area network (LAN) or wide area network (WAN). The network includes many thousands of computers, servers, and other similar items, several of which are shown for purposes of explanation.

15     The example of Figure 1 shows an NC terminal 104 which will be used for exemplary purposes herein. However, it should be understood that the invention is applicable to a variety of computing devices.

20     In operation, an exemplary NC terminal 104 is used to establish a communications session with a particular host 102. The host 102 is an IBM 3270 type of host which communicates with its terminals using a specified protocol, and includes a plurality of particular screens which it can download to terminals and which are dependent upon the particular applications actually running on host 102.

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When the connection is desired to be made, NC terminal 104 of Figure 1 first connects with server 103 using standard Internet protocols. Server 103 includes various files of software which contain the appropriate communications software for communicating with a variety of host computers, one of which is the IBM S/390 utilizing the TN3270 protocol for communications. The software for 3270 communications is downloaded to NC terminal 104 which may then utilize the software for communicating with host 102.

Additionally, the server 103 downloads to NC terminal 104 a table containing the unique identification numbers which will be generated by each screen downloaded from the host when the screen recognition algorithms of the '961 patent, or other such screen recognition algorithms, are executed. For each such unique identification number, there is a 4 digit tag. An exemplary such table, denoted a screen table, is shown below.

<u>Unique ID</u>	<u>Tag</u>
123456	A002
579182	B013
613247	A005
421685	A042
683217	B401

Optionally, NC terminal 104 may send to server 103 information regarding with which host it will be communicating. In such a scenario, server 103 may download only the communications software required for terminal 104 to communicate with host 102, and the appropriate screen tables. Alternatively, server 103 may download software and screen tables for all of the possible hosts, and terminal 104 may then select the appropriate information to use.

During the implementation of a particular application, host 102 downloads a variety of different screens. These green screens, as they are called, are processed through screen recognition algorithms such as that described in the previously incorporated '961 patent and '583 application. The processing of each screen generates a unique identification number. The table previously downloaded to the NC is utilized to ascertain the tag from the unique identifier.

After the screen is processed, NC terminal 104 communicates with server 103. More specifically, the screen identifier is sent to server 103, and server 103 then locates the proper GUI interface information. The GUI information, which prescribes how to present the information in graphical form, is sent to NC terminal 104.

Figure 2 shows a flow chart of the software which may be resident in NC terminal 104 for implementing the configurable terminal in accordance with the techniques of the present invention. The flow chart is intended to show only the high level steps, as the programming details will be apparent to those of skill in this art.

After communications with server 103 is established at block 201, the communications software for communicating with a specified host is downloaded to NC terminal 104. Download screen ID 203 downloads the table of information from server 103 to terminal 104



for identifying the particular screen which has been downloaded from host 102. The connection from NC terminal 104 to host 102 is established at block 204, which implements a prescribed communication protocol.

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Once the communications connection is established, screens of information, depending upon the particular application being run, will be downloaded from host 102 to NC terminal 104. These screens of information are waited for at block 205 by the NC terminal 204.

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The screen of information is then placed into a presentation space and it is recognized using a screen recognition procedure at block 207. The particular screen recognition algorithm used is not critical to the present invention but may be of the type described in the '961 patent.

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After the screen is recognized and a screen ID is generated, the decision point 208 determines whether or not such screen is contained in the screen table at the server. If it is, then the tag is sent to the server and customization data is obtained from the server at block 209. The customized GUI screen is presented to the user at block 210.

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On the other hand, if the list of screen IDs previously downloaded at block 203 does not contain the ID generated, then a default GUI screen is presented. The default screen may be of any type desired by the user.

At block 212 a keyboard input, often including parameters entered into the GUI screen, is processed.

If there is a request for special services which may be resident only at server 103, then blocks 214 and 215 implement the functions of obtaining the special services and presenting them to the user. If there is no request for special services, then the keyboard input is simply processed in accordance with the application, and the algorithm returns to block 205 to await downloading of the next set of information from host 102.

Special services may include a variety of items dependant upon the screen and/or position of the cursor on the screen. For example, context sensitive help, lists of valid values for a field, display of signatures associated with the field, etc..

The special services may be downloaded in a manner similar to that utilized for downloading screens of information. Specifically, as previously explained, a tag is generated from the unique screen ID associated with each downloaded screen of information. The NC terminal utilizes the tag with a suffix in order to request that the GUI screen information be downloaded from the server. Thus, after tag B013, for example, is generated, a message indicating that the GUI screen information for screen B013 is being requested may be sent from the NC terminal to the server 103. This results in the server downloading the GUI screen

information to NC terminal 103.

One way of performing the foregoing is to simply send a message from NC terminal 104 to server 103 requesting B013.SCR, where the suffix SCR indicates that the screen information is requested.

When special services are being requested, such services may be dependent upon not only a screen of information at the NC terminal, but the location of the cursor on that screen. Thus, the aforementioned suffix may be replaced with a suffix indicating row and column number of the cursor. This would indicate the particular field where the cursor is, and thus an appropriate file at server 103 which contains information relevant to that field will be downloaded to NC terminal 104.

While the above describes the preferred embodiment of the invention, it is understood that various modifications and additions will be apparent to those of ordinary skill in the art. Such modifications are intended to be covered by the following claims.

**CLAIMS:**

1. The method of communicating between a host computer and a remote terminal over a data network comprising the steps of:

establishing a first communication session between said terminal and a communications server;

downloading, from said server to said terminal, communications software for communicating between said terminal and said host;

utilizing said communications software to implement a second communications session between said terminal and said host.

2. The method of claim 1 further comprising the step of specifying, during said first communications session, which communications software is desired to be downloaded.

3. The method of claim 1 further comprising:  
receiving, during said second communications session, information from said host at said terminal;  
decoding the information at said terminal;  
sending the decoded information to said server over said network;

in response to said step of sending, transmitting from said server to said terminal, presentation information specifying how information received from said host at said NC terminal should be presented to a user of said terminal.

4. The method of Claim 3 further comprising:

identifying, at said terminal, cursor position and screen information, said information being based upon which screen is being displayed and a position on that screen of a cursor;

5 assembling, at said terminal, a data structure indicative of said cursor position and screen information;

transmitting said data structure to said server; and conveying, in response to said step of transmitting, context sensitive display information from said server to said terminal.

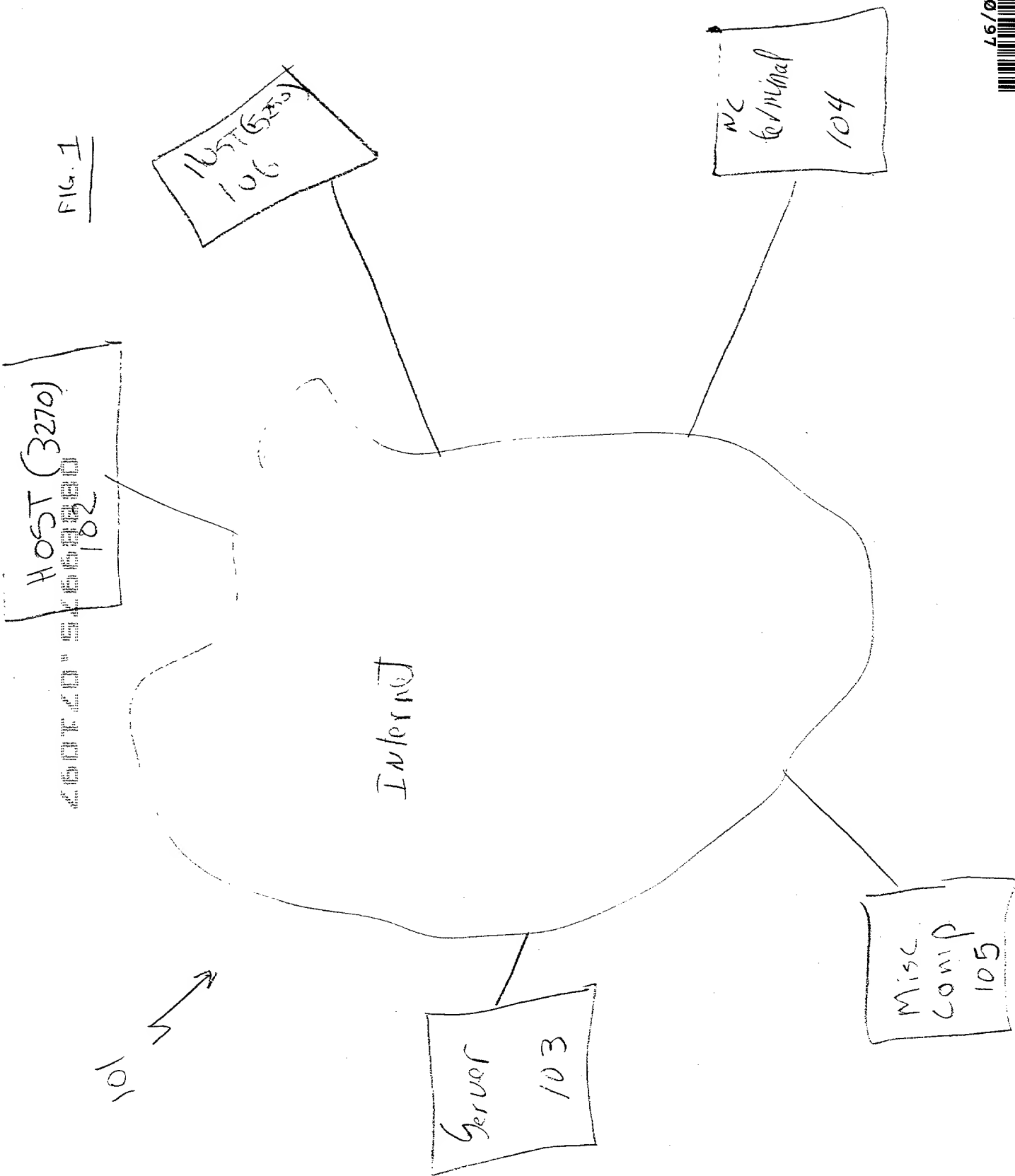
10

5. The method of claim 4 wherein said terminal is an NC terminal.

15 6. The method of claim 4 wherein said context sensitive display information is a list of available choices for a field.

# ABSTRACT

An improved technique of allowing terminal emulators to communicate with remotely located hosts comprises the steps of communicating first with a server which downloads communications software to the terminal emulator. The communications software is then utilized to communicate with the host, and screens of information downloaded by the host are recognized by the NC terminal. The terminal then communicates with the server to determine how to present such downloaded screens to a user.



$\lambda$	$\lambda^2$	$\lambda^3$	$\lambda^4$	$\lambda^5$	$\lambda^6$	$\lambda^7$	$\lambda^8$	$\lambda^9$	$\lambda^{10}$	$\lambda^{11}$	$\lambda^{12}$	$\lambda^{13}$	$\lambda^{14}$	$\lambda^{15}$	$\lambda^{16}$	$\lambda^{17}$	$\lambda^{18}$	$\lambda^{19}$	$\lambda^{20}$
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536	131072	262144	524288	1048576
3	9	27	81	243	729	2187	6561	19683	59049	177147	531441	1594323	4782969	14348907	43046721	129139161	387430483	1162291449	3486874347
4	16	64	256	1024	4096	16384	65536	262144	1048576	4194304	16777216	67108864	268435456	1073743872	4294967040	17179869440	68719476736	271735168000	1073743872000
5	25	125	625	3125	15625	78125	390625	1953125	9765625	48828125	244140625	1220703125	6103515625	30517578125	152587890625	762939453125	3814697265625	19073486328125	95367431640625
6	36	216	1296	7776	46656	279936	1679616	10077696	60466176	362793024	2176778176	13060669056	78364014720	470184088320	2821104529920	16926627179520	101559763077120	609338578462720	3656031270772480
7	49	343	2401	16807	117649	823543	5724253	39969771	279796407	1958575849	13710030943	95970216601	671791516207	4702540613449	32917784294143	230424490058999	1612971430412993	11290800012890949	79034600089236643
8	64	512	4096	32768	262144	2097152	16777216	134217728	1073743872	8589934592	68719476736	549755813888	4398046510080	35184372082048	281474976656384	2251800005251072	18014400042008576	144115200336068608	1152921602688549248
9	81	729	6561	59049	531441	4782969	43046721	387430483	3486874347	31381699093	282110452993	2539898136949	22859086232541	205731776092869	1851585984835821	16664273863522389	15000000000000000	135000000000000000	1215000000000000000
10	100	1000	10000	100000	1000000	10000000	100000000	1000000000	10000000000	100000000000	1000000000000	10000000000000	100000000000000	1000000000000000	10000000000000000	100000000000000000	1000000000000000000	10000000000000000000	100000000000000000000

